

**STATUS OF MINERAL RESOURCE INFORMATION FOR THE
TURTLE MOUNTAIN INDIAN RESERVATION, ROLETTE COUNTY,
NORTH DAKOTA**

by

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Administrative Report BIA-80
1981

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SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Turtle Mountain Indian Reservation, 7½ miles south of the Canadian border, encompasses 72 square miles in Rolette County, North Dakota. The reservation and the surrounding area has an Indian population of 7,305 (BIA, 1972), consisting mainly of Chippewas and some Crees. The topography of the reservation is characterized by forested rounded hills, and numerous undrained lakes, ponds, and bogs.

Sand and gravel deposits associated with Continental glaciation in the Turtle Mountains are typically small, contain varying amounts of such deleterious material as shale, and are poorly sorted. The deposits provide a source of sand and gravel for a limited local market.

The potential for economic development of clay, lignite, and manganese has been investigated. Little or no development is expected in the foreseeable future.

A limited amount of oil and gas exploration in Rolette County, located on the edge of the Williston Basin, has failed to locate any oil or gas, on or adjoining the reservation. Although results of past drilling are not encouraging, present information indicates that even this limited potential holds the best possibility for additional tribal mineral income through leases and potential production.

INTRODUCTION

The Bureau of Mines (USBM) and U.S. Geological Survey (USGS) collaborated in preparing this report for the Bureau of Indian Affairs (BIA)

under an interagency agreement to compile and summarize available information on the geology, mineral resources, and potential for economic development of mineral resources on certain Indian lands. Sources of information for the study included materials from published reports, personal communications, and a reconnaissance-level field trip in October 1979.

Totaling 77,218 acres, the Turtle Mountain Indian lands (BIA, 1978) (Figure 1) include 36,052 acres of tribal and 40,996 acres of allotted lands plus 170 acres of government owned lands (Figure 1). The reservation proper encompasses two townships, 72 square miles, that extend 6 miles north-south and 12 miles east-west. This study is confined to the lands within the reservation boundary, but the tribe owns approximately 40,996 acres of trust land outside the reservation that is included in the 77,218 total acres. Because allotted, tribal, and deeded lands are scattered throughout the reservation, this study makes no attempt to delineate specific categories of lands and thus considers the entire reservation.

Belcourt (pop. 1,900), tribal headquarters and only town on the reservation, is on U.S. Highway 281 and State Highway 5, a general east-west route. Other nearby communities are Rolla (pop. 1,458), 6 miles east of the reservation on Highway 281, and Dunseith (pop. 811), 14 miles west on Highway 281. Graveled and unimproved roads which traverse much of the reservation provide access in a roughly rectangular grid that basically follows section line. The nearest commuter airline service is 60 miles to the southeast at Devils Lake (pop. 7,078), with the nearest major airline center being 80 miles southwest at Minot (pop. 32,290).

Annual precipitation averages nearly 17 inches in this semiarid area. Temperatures average about 2°F during the long, harsh winters and nearly 66°F during the short summers.

Six USGS quadrangle maps--Belcourt, Carpenter Lake, Lake Upsilon, Lake Upsilon SE, Lake Upsilon SW, and Saint John, North Dakota--display the topography at a scale of 1:24,000, and a contour interval of 10 feet. Map editions used in this study were dated from 1955 to 1969. The topography also is shown in less detail on the USGS Devils Lake map (NM14-11), scale 1:250,000, and contour interval of 100 feet. The most current edition is 1971, revised.

ACKNOWLEDGMENTS

Bureau of Indian Affairs personnel at Belcourt, North Dakota, provided useful information for this report. A partial list of those assisting includes Fred Gillis, Superintendent of the Turtle Mountain Reservation; Roy Ferris, Assistant Land Operations Officer, who guided the site examination; and Jim Anderson, Branch of Roads.

GEOGRAPHY

The reservation is on the southeast flank of the Turtle Mountains in the Central Lowlands physiographic province. The lowlands surrounding the mountains are classified as the Drift Prairie (Bluemle, 1973). Approximately 47 sections of the 72 sections comprising the reservation are located on a hilly upland that rises about 300 feet above the prairie altitude of 1,800 feet (Deal, 1971, plate 1). Highest point on the reservation is about 2,250

feet on a hill in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 3, T. 163 N., R. 71 W., and NW $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 10, T. 162 N., R. 71 W., although several hills are almost 2,400 feet high in another part of the Turtle Mountains.

As the only large, naturally forested area in the State, the Turtle Mountains receive more precipitation than the adjoining plains. Rolling reservation lands in the outwash plain below the mountain front to the south and east contain many depressions, together with small undrained lakes, ponds, or swamps. These bodies of water have been referred to as ". . . small, unstable-environment lakes . . . and large stable-environment lakes" (Deal, 1971, p. 53).

The area is poorly drained. Ox and Wolf Creeks meander southward from the southern boundary of the reservation.

GEOLOGY

The Turtle Mountains are a drift-covered outlier that rises above the general level of the Drift Prairie in the northern part of the Central Lowland physiographic province of North Dakota (Bluemle, 1973; Colton and others, 1963).

The Drift Prairie of northern North Dakota consists of landforms that are largely the result of glacial deposition that ended some 13,000 years ago. These glacial drift deposits on the Turtle Mountains range from 200 to 600 feet in thickness. The Turtle Mountains are characterized by dead-ice moraine that resulted when the glaciers ceased to move, and as they melted, a rugged undrained landscape remained (Bluemle, 1973).

The youngest exposed rock is the Coleharbor Formation which consists mainly of glacial depos-

its and is present over much of the state of North Dakota (Bluemle, 1973).

Glacial gravels, sand and silt, and outwash deposits of sand and gravel of the Coleharbor Formation cover the entire reservation and mask the underlying sedimentary rocks. The subsurface rocks can therefore only be identified from logs of oil and gas exploration wells that have been drilled at various sites surrounding the reservation. The subsurface sedimentary rocks constitute a nearly complete record of geologic history spanning time from Precambrian to Quaternary (Carlson and Anderson, 1973, p. 31).

Small isolated rock outcrops to the east and west of the Turtle Mountains (Clayton, 1980) indicate that the bedrock formations, above the Niobrara Formation, that underlie the reservation are in order of increasing age: the Bullion Creek (Paleocene), Hell Creek, and Pierre (Upper Cretaceous) Formations.

With the exception of a test well drilled in the NW¼ sec. 16, T. 162 N., R. 71 W., in which beds of lignite were encountered at intervals between depths of 300 to 480 feet, the youngest sedimentary rocks logged were those of the Niobrara Formation of Upper Cretaceous age. The Niobrara Formation was encountered at depths ranging from 1,034 to 1,076 feet.

The nearest well to penetrate the entire sedimentary sequence (No. 1, Sebelius, sec. 23, T. 161 N., R. 73 W., Lion Oil Co.) is about 8 miles west-southwest of the reservation. Precambrian crystalline rocks were logged at a depth of 5,502 feet.

Stratigraphy

Quaternary System.--Coleharbor Formation (Holocene and Pleistocene). Sandy silty clay with pebbles of limestone, dolomite, granite, gneiss, and basalt; and nonorganic bedded clay, silt, sand, and gravel; as much as 600 feet thick (Clayton, 1980).

Tertiary System.--The Bullion Creek Formation, a river, lake, and swamp sediment, consists of yellow-brown silt, sand, clay, sandstone, and lignite. The Hell Creek Formation, a river sediment, consists of gray sand, silt, clay, and sandstone. The Pierre Formation, a marine offshore sediment, consists of dark-gray shale. The aggregate thickness of these three bedrock formations totals about 500 feet. The general character of the underlying sedimentary formations is summarized in [Table 1](#).

TABLE 1

Generalized Stratigraphic Section of Sedimentary Rocks, Turtle Mountain Indian Reservation,
North Dakota.

(Note: the formation names and depths are those used by the drilling companies in their logs as
published by Petroleum Information, Denver, Colorado.)

Cretaceous System.

Niobrara Formation. Shale, dark-gray to medium-dark-gray, calcareous, marine, fossiliferous; Upper Cretaceous; includes Carlisle shale; 400 to 450 feet thick; contains some bentonite.

Greenhorn Formation (including Graneros Formation). Limestone and shale, gray to dark-gray, fossiliferous, marine, some glauconitic and calcareous fine-grained sandstone; Upper Cretaceous; 400 feet thick.

Dakota Group. Sandstone, siltstone, shale, light- to medium-gray, marine and non-marine, quartzose, in places porous, dark gray shale partings; Middle to Lower Cretaceous; 500 feet thick.

Jurassic System.

Piper Formation. Limestone, sandy limestone, silt; and shale, massive white gypsum at base, gray, maroon, and green, marine, fossiliferous; Middle Jurassic; 100 to 200 feet thick.

Triassic System.

Spearfish Formation. Siltstone, sandstone, mudstone, limestone, and anhydrite, light-reddish-brown, pink, pale-red, olive-gray; non-marine; Triassic; 50 to 400 feet thick.

Mississippian System.

Lodgepole limestone. Limestone, shale, chert, medium-gray, yellowish-gray, marine, fossiliferous; Lower Mississippian; 150 to 500 feet thick.

Englewood limestone, including Bakken Formation. Shale, brownish-gray, calcareous, fissile, some fine-grained pyrite; limestone, brownish-gray, light yellowish-gray, finely crystalline, fossiliferous, marine; Lower Mississippian; 50 to 300 feet thick.

Devonian System.

Nisku (Birdbear Formation), including Three Forks shale. Shale, siltstone, and limestone, with some dolomites; greenish-gray, yellowish-gray, moderate-brown; calcareous shale and siltstone; some anhydrite; marine, fossiliferous; Upper Devonian; 40 feet thick.

Jefferson Formation. Including Duperow, Cooking Lake, Souris River, and Dawson Bay Formations. Limestone, dolomite, shale, and some anhydrite, generally finely crystalline, light yellowish-gray, pale-yellowish-brown, light gray; marine; fossiliferous; Middle to Upper Devonian; 900 feet thick.

Winnepigosis Formation. Limestone and dolomite, dark-gray to light- yellowish-brown, crystalline, dense, argillaceous; shale, greenish-gray to red, silty, dolomitic; anhydrite beds; Lower Devonian; 40 feet thick.

Ashern Formation. Limestone, clayey, argillaceous, gray; shale, brick-red to grayish-orange; dolomite; anhydrite; Lower Devonian; 60 feet thick.

Silurian System.

Interlake Formation. Limestone, dolomitic, light-brownish-gray to light-gray, pelletoidal, fragmental; dolomite, finely crystalline; thin beds of shale and anhydrite; Silurian; 5 to 50 feet thick.

Ordovician System.

Stony Mountain Formation, including Gunton Member. Limestone, dolomitic; dolomite, heavy-bedded, dense, massive, brownish-gray to yellowish-brown; limestone, medium-gray, fossiliferous; shale, dark-gray, fossiliferous; Upper Ordovician; 140 feet thick.

Red River Formation. Limestone and dolomitic limestone, yellowish- to brownish-gray, fossiliferous, argillaceous; thin anhydrite beds; 600 feet thick.

Winnipeg Group, including Rough lock, Ice box, and Black Island Formations. Sandstone and siltstone, light-gray, fine-grained, calcareous; shale, greenish-gray; calcareous, silty; shale, greenish-gray, fissile, black phosphate nodules; sandstone, light-gray, fine- to medium-grained, quartzose, some pyrite; Middle to Lower Ordovician; 150 feet thick.

Precambrian System.

Superior Province rocks of eastern North Dakota; granite, granite gneiss, and bands of schist.

Structure

The Turtle Mountain Indian Reservation is at the eastern edge of the Williston Basin, a major geologic structure in North Dakota. The depth to the Precambrian crystalline basement rocks is estimated to range between 4,900 and 5,300 feet. The sedimentary rocks dip westward at approximately 50 to 60 feet per mile toward the central part of the Williston Basin in Western North Dakota.

MINERAL RESOURCES

Sand and gravel is the only known mineral resource of economic importance in the Turtle Mountain Reservation or vicinity. Potential for developing minerals found in other parts of the State, such as oil, natural gas, or lignite, does not

appear promising here. Deeply buried lignite is not economic now nor in the foreseeable future. The potential for oil and natural gas has not been completely eliminated however.

Clay

In a 1961 Bureau of Mines study of the Turtle Mountain Reservation's mineral resources, Harrer sampled and tested clays taken from favorable sites on, and adjoining the reservation. Samples were taken from the glacial till in NE $\frac{1}{4}$ sec. 5, T. 161 N., R. 72 W., southwest of the reservation; NW $\frac{1}{4}$ sec. 2, T. 162 N., R. 70 W., in the northeast part of the reservation; SE $\frac{1}{4}$ sec. 32, T. 163 N., R. 70 W., northeast of the reservation; SW $\frac{1}{4}$ sec. 30, T. 163 N., R. 71 W., northwest of the reservation; and SW $\frac{1}{4}$ sec. 32, T. 162 N., R. 74 W. This last location, shown on

Harrer's figure 1 as being in SW $\frac{1}{4}$ sec. 32, T. 162 N., R. 71 W., is described as "on the reservation"; thus, R. 71 W. is used in this report.

Harrer (1961) concluded, "Because of their inferior quality, clays on Turtle Mountain Reservation and adjacent Indian lands are not considered a source of competitive raw materials for the fired clay and ceramics industry." No new information has been added to alter this earlier conclusion.

Manganese

Glacial drift on the Turtle Mountains is the site of three manganese deposits associated with cold springs. None of the deposits are on the reservation. The most important deposit is at Mineral Spring in N $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 22, T. 162 N., R. 73 W., Rolette County, about 4 miles northwest of Dunseith, and about 9 miles west of the reservation. All three of the deposits were investigated and described during World War II. ". . . there are 15,600 tons of manganese and calcareous tufa in the main part of the deposit" (Hendricks, 1943, p. 595). "The analyses of the manganese ore at Mineral Spring show that it is definitely of low grade . . . and averages 9.97 percent" (Hendricks, 1943, p. 601).

About 1 mile north of Dunseith in NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 30, T. 162 N., R. 72 W., and about 6 miles west of the reservation, a spring contains calcareous tufa with traces of manganese.

Manganese is indicated at Holy Spring in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 25, T. 162 N., R. 72 W., about $\frac{3}{4}$ mile west of the reservation. "About 50 or 60

feet below the spring opening . . . there are indications of manganese but in no large amounts" (Hendricks, 1943, p. 598).

The manganese precipitated in these three springs is far below the concentration and quantity necessary for any present commercial interest, and no development of such deposits as a source of manganese is foreseen. No similar deposits are known to occur on the reservation.

Lignite

Lignite has been mined in North Dakota for about 100 years, beginning with small underground mines and later dominated by large, open-pit operations. Mining has been confined to the Sentinel Butte and Tongue River members of the Paleocene Fort Union Formation.

On the reservation, lignite was encountered in the test well drilled in NW $\frac{1}{4}$ sec. 16, T. 162 N., R. 71 W., at several intervals between depths of 300 to 480 feet. These deeply buried thin beds are not economic to mine, now or in the foreseeable future.

About 6 miles west of the reservation, a 3-foot bed of lignite has been reported in an old mine shaft about 2 miles north of Dunseith. The steeply north-dipping bed, that was mined briefly, was described as "a slide," but it may be located on a fault (Hendricks, 1943, plate 593). There is no evidence that this lignite bed extends to the reservation.

Petroleum and Natural Gas

The reservation is on the eastern edge of the sedimentary Williston Basin, one of the major petroleum-producing provinces in the country. Seventeen stratigraphic horizons, ranging in age from the Cambrian Deadwood to the Cretaceous Eagle Sandstone, produce oil and/or gas from within the basin (Figure 2) (Gerhard, 1979).

Neither oil nor gas has been discovered on the reservation. The only test well drilled there did not penetrate the entire sedimentary section; however, drilling was stopped at 3,440 feet in the Upper Devonian Nisku or Birdbear Formation. Cities Service Company drilled this well, the No. 1 Chippewa, in 1957, in C NW¼NW¼ sec. 16, T. 162 N., R. 71 W.

Several lower formations that produce oil or gas in the Williston Basin were encountered in two test wells drilled to granite in Rolette County; these formations probably are present on the reservation.

In 1953, T. M. Evans drilled the No. 1 Andy Johnson in C NW¼SW¼ sec. 23, T. 160 N., R. 70 W., about 9 miles south of the reservation; and in 1953 Lion Oil drilled the No. 1 Sebelius in C SE¼NW¼ sec. 23, T. 161 N., R. 73 W., about 8 miles southwest of the reservation. The lower horizons productive elsewhere are the Ordovician Winnipeg Sandstone, Ordovician Red River Formation, Silurian Interlake Formation, and the Lower Devonian Winnipegosis Formation.

Nearest production to the reservation is approximately 23 miles west in SW¼SE¼ sec. 28, T. 163 N., R. 75 W., Bottineau County, in the

western Turtle Mountains. This well, completed in December 1970, had an initial pumping production of 1½ barrels of oil per day from the Triassic Spearfish Formation at a depth of 3,367 to 3,379 feet.

Following important Mississippian oil discoveries in Bottineau County in the 1950's, several additional small fields were discovered there in the 1970's.

From available information, the best opportunity for additional mineral income for the reservation appears to be through the sale of oil and gas leases, and potential production from the leases. Past drilling results, however, warrant only limited optimism.

Sand and Gravel

According to a personal communication from V. Tepordei of the Aggregate Branch, Bureau of Mines, Washington, D. C., "Sand and gravel production in 1978 from Rolette County was 68,000 tons, valued at \$88,000."

Sand and gravel occurs throughout most of the county but generally contains too much deleterious material, such as shale, to be used for good quality concrete aggregate. The principal use of sand and gravel is for road construction and maintenance; however, a small local construction industry also is a consumer. Locally, some of the best quality sand and gravel is considered to come from the southwest part of the county.

A map of the sand and gravel resources of Rolette County, on Plate 2 of North Dakota Geological Survey Bulletin 58, indicates that most of

the reservation contains ". . . small isolated deposits of variable quality capable of producing sand and gravel for individual use." About 10 percent of the reservation is shown to contain ". . . commercial quantities of medium to low quality gravel with lesser amounts of sand . . . may contain as much as 30% shale pebbles." Approximately 5 percent of the reservation is shown to have ". . . no surface sand and gravel supplies" (Figure 2).

Conflicting reports were obtained on current sand and gravel operations. Available information reveals there are now 24 inactive pits on the reservation, but at the time of the field reconnaissance in October 1979, one of these pits was in operation in S½SE¼ sec. 35, T. 162 N., R. 171 W. Virtually all pit operations in this area are terminated during winter.

Of the numerous pits on the reservation, most are quite small but many appear to have been worked in the recent past. Present mobile gravel mining equipment permits operating a pit for only a few days before the operator moves to a more convenient location. Such mobility is particularly common and desirable in road maintenance.

R. B. Williams of the Mining Enforcement and Safety Administration (MSHA) field office in Watertown, S. Dak., reports in recent correspondence that four pits recently were inspected in Rolette County, and that one of these later stopped producing on Dec. 7, 1979 (probably owing to winter weather). None of the pits inspected were on the reservation; however, the one that terminated operations was the "Turtle Mountain Tribal Pit, BIA Road," and operated

about 3 miles northeast of Dunseith (about 3 miles west of the reservation). By regulation, all pits are subject to inspection. In recent correspondence, R. G. Salisbury of the North Dakota State Highway Department District Office in Devils Lake, lists three gravel pit locations in the Turtle Mountain Reservation: (1) NW¼ sec. 1, T. 162 N., R. 70 W.; (2) NE½NE¼ sec. 20, T. 162 N., R. 70 W.; and (3) S½SE¼ sec. 35, T. 162 N., R. 71 W. The last pit, the one seen in operation in October, 1979, is described as containing ". . . approximately 40,000 tons of good quality material." The quantity in the other two pits is shown as "unknown." Pit (1) is listed as "fair quality;" and number (2) as "good quality."

The Turtle Mountain Reservation Department BIA, recently sent the Bureau of Mines a map of 10 known gravel pits on the reservation. Shown on Figure 1, nine of the 24 sand and gravel pits on the reservation are in the vicinity of Belcourt. With reference to the potential of this area, Deal (1971, p. 80) notes that "The three major communities in the northern part of the county, Dunseith, Belcourt, and Rolla, are all located on flat to undulating gravel deposits . . . the best sand and gravel resources in the county."

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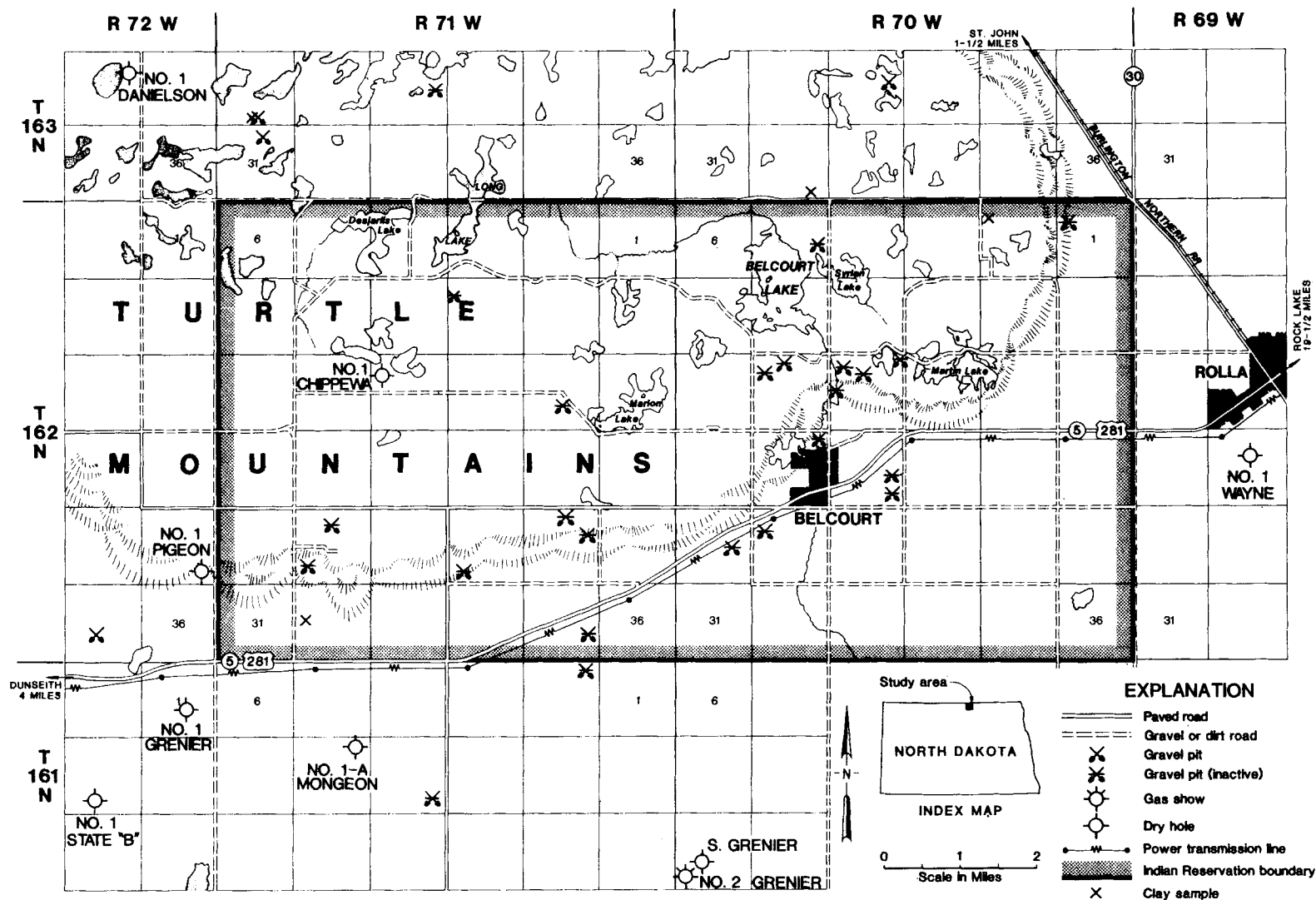


Figure 1. Map of Turtle Mountain Indian Reservation and vicinity, Rolette County, North Dakota.

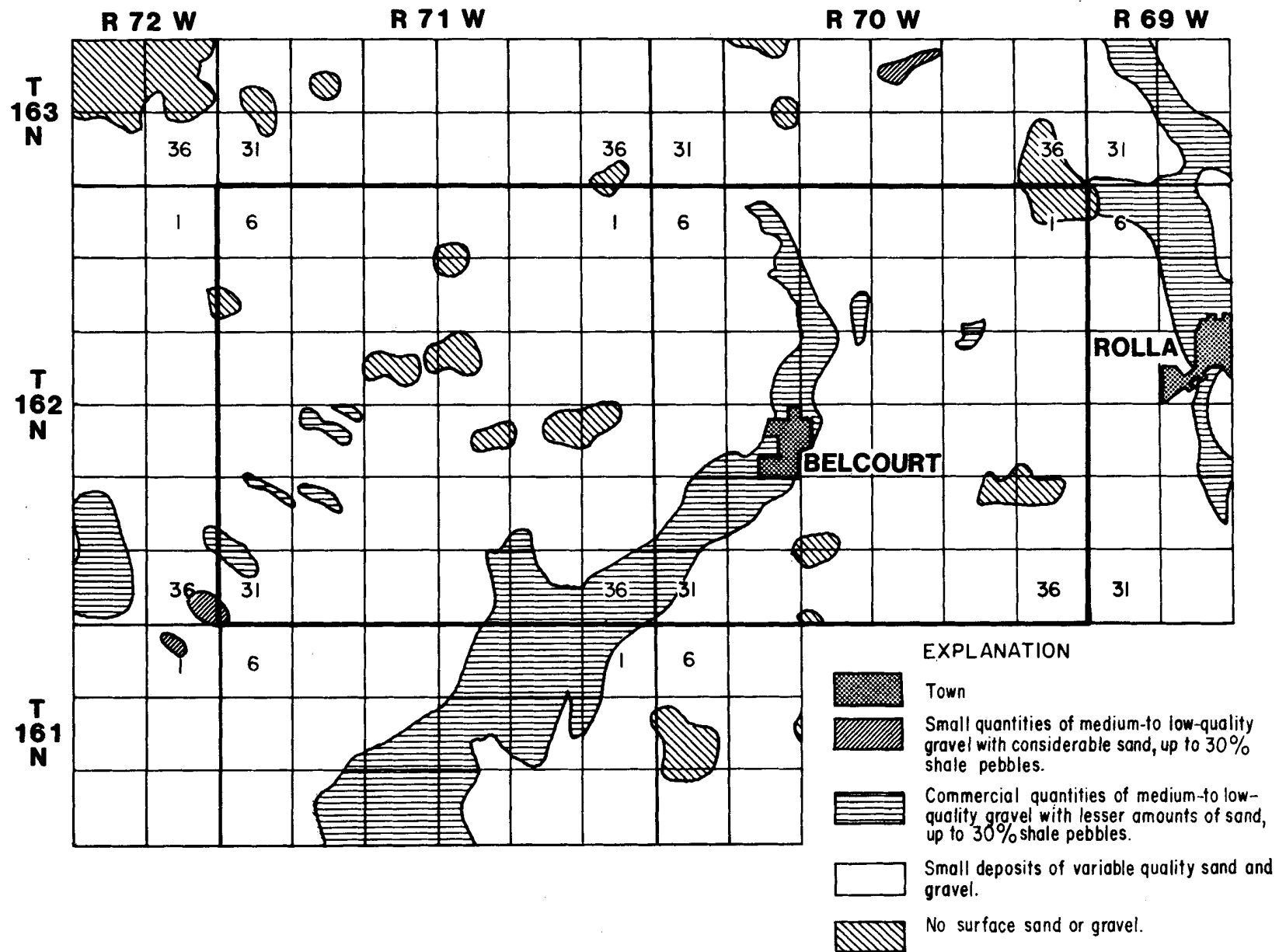


Figure 2. Sand and gravel resources in Turtle Mountain Reservation and vicinity (Adapted from Deal, 1971).